Journal of the Society of Arts.

FRIDAY, JANUARY 25, 1856.

MEETING OF REPRESENTATIVES FROM INSTITUTIONS.

FRIDAY, JANUARY 18, 1856.

On Friday evening, at six p.m., a meeting of representatives of Institutions in Union with the Society in the neighbourhood, or within easy access of London, was held, pursuant to the notice inserted in the *Journal*. The chair was taken by Dr. Booth, F.R.S., the chairman of the Council, who, after the Secretary had read the notice convening the meeting, explained that the object of the Council was to confer with those practically engaged in the management of Institutions and in the practical working of them, and to invite their co-operation in promoting the working and formation of classes, with a view to the subsequent examination of the members, such examinations to be followed by certificates as tests of merit in those examined. The lecture system was also open for discussion.

Letters from Mr. James Wilson, President of the People's College, Sheffield, were read, by which it appeared that lectures were a very subordinate part of the plan of that Institution, and that little importance was there attached to them, lectures being considered *instructional* rather than *educational*. The result of their experience went to show, that large numbers would "never be induced to attain or attempt a higher state of education than their *apparently* necessary state of life requires." It appears that examinations are about to be instituted there, and good results are anticipated from them, as likely "to lead to classified and systematic study." The writer further suggests examinations in those classes of study, through the different branches of which a student should pass, after which he might offer himself as a candidate for the Society of Arts examinations.

A discussion then took place, from which it appeared to be the general opinion that classes and class teaching were to be looked upon as the most important means, where practicable, of rendering the Institutions really efficient for the objects for which they are established. It was, however, urged by nearly all the speakers, that experience showed (and, indeed, it was unreasonable to expect it should be otherwise) that classes would not be attended simply for learning's sake. There must be some object in view. The most successful classes at Crosby-hall were those for the study of French and German, because the young men in the city of London, members of that Institution, were mostly engaged in the counting-house, where such acquirements had their value. Examinations were, doubtless, desirable as tending to render the study in classes less desultory; but examinations would not be generally and voluntarily undergone by individuals unless some definite object was to be obtained. Unless some direct benefits were to result to the candidate from the certificate to be awarded by the Society, and unless the certificate had some commercial value, it was the general opinion that the examination scheme would fail. It was considered, however, that the object would be attained by the Society procuring its certificates to be recognised by employers as testimonials worthy of credit; this would give the certificate a commercial value, which would render it worth competing for, and candidates for examination would, doubtless, readily be forthcoming. The Society was encouraged to proceed with its examination scheme.

With reference to lectures, it appeared to be the opinion of the meeting that, although lectures could not come into competition with class teaching, when classes were attainable, as a means of education, still even in that case they were considered as having a value as feeders to the classes; and when, from the character of the Institution, classes were impracticable, the lecture system was valuable as supplying information to those who had no other means of getting at it.

Some objections having been raised to the extensive and high range of the subjects as proposed in the Society's plan for examination, it was explained, as stated in the Society's memorandum, that the Council, in putting forth the list of subjects, desired to "indicate the extent to which it was hoped that the progressive improvement of the Institutions and the development of popular education might render it requisite to provide for the examination of candidates;" and that the Council had no expectation that for some time to come the Institutions would be prepared to present well qualified candidates for examination in many of the subjects: but, in the meanwhile, arrangements would be made for examination in such subjects as might be taught in the Institutions, and it was hoped that the range of subjects might be enlarged in each succeeding year.

The meeting was attended by the following members of Council and of the Institutes Committee:—Rev. Dr. Booth, F.R.S.; Messrs. W. Hawes; Matthew Marshall; I. J. Mechi, and G. F. Wilson, F.R.S.; Mr. A. Coleman, and Rev. F. Temple. Also by the following Representatives from the Institutions in the places named:—Barnet, Mr. S. J. Baldock; Basingstoke, Mr. Wyndham S. Portal; Battersea, Mr. R. Story, Mr. G. F. Wilson, F.R.S., and Mr. Samuel Bowes; Belmont, Mr. G. F. Wilson, F.R.S., and Mr. G. H. Spicer; Bexley Heath, Mr. Flaxman Spurrell; Bramley, Mr. T. J. Pearsall; Clapham, Mr. I. C. Buckmaster; Deptford, Mr. Alexander Dickson; Epsom and Ewell, Mr. George M. Coppard; Greenwich, Mr. David Bass, Mr. John Bell, and Mr. James Spencer; Hants and Wilts Education Society, Mr. Wyndham S. Portal; Kelvedon, Mr. I. J. Mechi; Lancaster, Mr. Robert Galloway; Lewes, Mr. Henry Brown; London, Bank of England Library and Literary Association, Mr. Matthew Marshall; Camden Literary Institution, Mr. John Yarnold; Crosby Hall Evening Classes for Young Men, Rev. Charles Mackenzie and Rev. Richard Whittington; London and South-Western Railway Literary and Scientific Institution, Mr. Fred. J. Macaulay; London Domestic Mission Society, Mr. J. M. Wade; London Mechanics' Institution, Mr. S. Vallentine; Tailors' Labour Agency Literary Institute, Mr. Joseph A. Dunn; Royston, Mr. John Warren; Sheffield, Mr. T. J. Pearsall; Stockton-on-Tees, Mr. T. J. Pearsall; Wandsworth, Mr. William Miles Medcraft; and Windsor and Eton, Mr. Joseph Lundy and Mr. Chas. Thos. Phillips.

SEVENTH ORDINARY MEETING.

WEDNESDAY, JANUARY 23, 1856.

The Seventh Ordinary Meeting of the One Hundred and Second Session, was held on Wednesday, the 23rd instant, Dr. Lyon Playfair, C.B., F.R.S., Vice-President, in the chair.

The following Candidates were balloted for and duly elected:—

Abel, F. A.
Cohen, Henry Louis
Corbet, Henry
Dickson, William
Evill, William
Finch, Frederick Cotton, M.D.
North, Robert Samuel
Temple, Rev. Frederick

The paper read was

ON THE MANUFACTURES OF PRICE'S PATENT CANDLE COMPANY.

By G. F. WILSON, F.R.S.

I was asked to give a paper this session, and allowed to choose my favourite subject, the Manufactures of Price's Patent Candle Company.

As a member of Council I have been present at most of the late meetings. In my individual opinion, the Wednesday evenings, while they constantly increase in interest, are becoming too long; I have, therefore, made mine a short paper.

I will begin with the principal manufacture of the Company—Candles.

Candles may be divided into four classes:—

1. Beeswax, called wax candles.
2. Neutral fat, including spermaceti, tallow, and cocoanut candles.
3. Fat acid, known as stearic candles; and
4. Composite candles, being a mixture of stearic acid and neutral fat.

It is to the 3rd and 4th classes, the stearic and composite candles, to which, as forming the principal manufacture of the Company, I have first to direct your attention.

Notwithstanding all that has been written about candles, especially in the excellent Jury Report of the 1851 Exhibition, not one out of ten educated persons could answer the question, why a tallow candle requires more than three times the size of wick, to give the same amount of light, as a stearic candle; and if the tenth gave the right answer, namely, that it is owing to the glycerine being present in the one case, and having been separated in the other, the nine would be little the wiser. As a knowledge of common things is now considered desirable, I will endeavour to show the effect of the presence of glycerine, by means of some specimens, and will take tallow, as being the fat most generally known, for the example. Tallow, as it is separated by boiling from the fat of cattle or sheep, is composed of, at least, two distinct solid bodies, one liquid oily body, and a syrupy body.

The first solid constituent is called stearic acid, the second margaric acid, the liquid oil oleic acid, and the syrupy body glycerine, which serves as a base to the three acids.

On the table are specimens of tallow, stearine, margarine, oleine, and glycerine, and of stearic, margaric, and oleic acids, each having a plaited wick of the same number of threads of cotton. You will see the different power of illumination, in the great flame of the stearic, of the margaric, and of the oleic acids, in the feeble flame of the tallow, of the stearine, of the margarine, and of the oleine, and the hardly visible flame of the glycerine.

The glycerine is thus shown to have the effect of reducing the illuminating power of candle material; to get rid of or separate the glycerine for the purpose of obtaining the more valuable material for candles, was the necessity which first called in the aid of science to candle-making. Science, once introduced, has raised candle-making from a simple, clumsy, offensive, mechanical trade, into a first-class chemical manufacture, one offering the widest field for applications of the highest chemistry.

The time must soon, if it has not already, come, when a well-organised laboratory, and a thorough acquaintance with the works of the high scientific chemists, and even communication with some of themselves, will be considered necessary elements of candle-making success.

Of science applied to candle-making, Chevreul, the great French chemist, was, as is well known, the father. Candle-makers are bound, on all occasions, to offer their tribute to the wonderful accuracy and foresight of his early scientific experiments and writings.

My respect for him was lately put to a severe trial, which, however, it stood, when, in the splendid show at the closing of the Paris Exhibition, I had to see him walk up to take the medal which jury, group of juries, and council of presidents had voted to us, and which I had gone over to Paris to receive.

M. Chevreul's labours began in 1811, and were collected and published in his "Récherches Chimiques sur les Corps Gras," in 1823; in 1825, in conjunction with Gay Lussac, he attempted industrial applications of his scientific researches, and took out a patent in England, but did not succeed.

The first notification we have of fat acid or stearic candles commercially successful, was in a report made to the Society of Encouragement in Paris, in 1833, which stated that Messrs. Motard and Milly had succeeded in purifying an acid from tallow, of which they made candles, called "bougies de l' étoile," of which the manufacture and sale had risen to about 25 tons annually, while their price, 1s. 6½d. wholesale, 1s. 8½d. retail a pound, was sufficiently low to ensure them the preference they had begun to obtain. On the strength of this report, the "Society of Encouragement" voted a silver medal to MM. Motard and Milly.

The process employed by them for separating the fat acids from their glycerine, which was afterwards adopted by the English candlemakers, E. Price and Company among the number, was called lime saponification, and was shortly this:—

Tallow was boiled up with thin cream of lime, which caused the fat acids, by superior affinity, to forsake their glycerine to combine with the lime, the glycerine dissolving in the water; this combination was then broken by means of sulphuric acid, which, seizing on the lime, set free the fat acids; these were then separated, the liquid from the solid, by means of pressure.

This was an expensive process, as to each cwt. of tallow, 14 to 16 lbs. of lime, and 28 to 32 lbs. of sulphuric acid, were employed, and the candle material, stearic acid, when obtained, was only in the proportion of two parts to five of the tallow employed, and the other product of the tallow was a comparatively refuse oil.

I will now proceed to the candles of Price's Patent Candle Company. When on a a former occasion, in 1852, I had the pleasure of reading before the Society a paper upon a somewhat similar subject, I took the opportunity of answering in it some of the most common of the questions put by visitors at our works; having found the benefit of this, I will take the same liberty on the present occasion.

One very common question is, who was Mr. Price, or, put as it often has been by our French friends, M. Preece. As, I believe, this has never been answered, except verbally, I shall beg to do so now. Mr. Price never was anybody. In the days of the early establishment of our factory, besides business reasons, it would have been considered *infra dig.* for one who had been a merchant to become a candle-maker; my father and his partner, therefore, adopted the trading name of E. Price and Co. In 1847 the great India house, of which some of the partners were at that time partners in E. Price and Co., getting into difficulties, and the extended scale of work requiring increase of capital, the concern was sold to a Joint Stock Company, which took the name of Price's Patent Candle Company.

In the month of October, 1840, from which time I can speak from personal knowledge, we employed 74 men and 10 boys, and manufactured about 20 tons of cocoa-nut candles, value £1590, and about 12 tons of stearic and composite candles, value £1227, during the month.

In the corresponding month of 1855, we employed 1098 men and 1191 boys and girls, and manufactured of stearic and composite candles and night-lights about 707 *tons*, value £79,500, in the month.

I will now shortly trace the steps of progress, and have the less scruple in doing so, as they give not merely the history of a single establishment, but as grafts from the Belmont tree have been carried and are now growing all

over the world, in France, Russia, America, Germany, Belgium, Holland, and Spain, a sketch of our progress is in fact that of an important new manufacture.

I shall not spend much time in tracing what was said and written by the French chemists and manufacturers, as nothing was put in practice by them before 1846 or 1847.

A patent trial in France, reported in the *Gazette des Tribunaux* of March 16th, 1851, fixes the date of the industrial introduction of fatty distillation into France as being in 1846 or 1847.

It is true that, had we studied some of the early suggestions of French chemists, our progress would have been more rapid and far easier. It is equally true that had Chevreul or Dubrunfant never spoken of fat distillation, we should have been exactly where we now are, not one step either more backward or more forward. We began fatty distillation at its beginning, and worked it out for ourselves, first, in a glass retort, then in a common still, heated by the naked fire, and experienced all the evils of the decomposition of glycerine and consequent evolution of acroleine, and of the decomposition of a part of the fat acids; we were, however, led on by the happy circumstance that our trade at that time being principally connected with cocoa-nut oil, our experiments were for the most part directed to that fat, the acids of which, from their comparatively low boiling point, distil over with but little decomposition, even when exposed in the apparatus to the action of the air. We thus obtained more favourable results than would have been arrived at if other fats had been operated upon.

The first important move in candles, following after De Milly's stearic acid candles, was the introduction of the now well-known composite candles. These were at the commencement of their manufacture composed of equal parts of stearic acid and of the hard part or stearine of cocoa-nut oil.

Their origin was this:—

On the occasion of her Majesty's marriage, in 1840, a great want arose for cheap self-snuffing candles for the window illuminations. My brother, J. P. Wilson, tried a mixture of the stearic acid and cocoa-nut stearine, both of which were being manufactured by E. Price and Company, and made, in their separate state, into candles, but never previously mixed; the public, contrary to the general opinion of the candle-dealers, proved wise enough not to mind the candles being greasy, but as the light was good, the candles comparatively cheap, and the nuisance of having to snuff done away with, they received the new composite candles with great favour, and the manufacture rapidly grew.

As no patent was taken out for the mixture of the fat acid and the neutral fat, other manufacturers soon made composite candles, by substituting cocoa-nut oil in its crude state for the cocoa-nut stearine used by E. Price and Company.

The next great move was fatty distillation and its attendant processes put into practice.

Chevreul and Gay Lussac had, in 1825, sketched out the idea of distillation of fatty bodies, and had even touched lightly on the introduction of steam into the distillatory apparatus. The idea of distillation then lay dormant until March 1840, when Mr. George Gwynne revived it, and took out a patent, the specification of which drew particular attention to distillation, especially for the purpose of purifying the fatty acids, and showed a point to be aimed at, the exclusion of the air from the apparatus while distillation was going on, the method he proposed being to exclude the atmosphere by means of an air-pump.

I believe this method was never carried on commercially on the large scale.

In a small apparatus I have seen it worked effectively.

More than a year afterwards, Dubrunfant, a French chemist, took out a patent in France, and one in England in the name of Mr. Newton, for purification and distillation of fatty bodies; the specification of this patent we met with for the first time in 1843, when, as is the custom of patentees, searching the records of the Patent Office before putting in the specification of our patent of 1842.

Afterwards, when some French manufacturers had introduced practical distillation into France, in 1846 or 1847, from imperfect information derived originally from our factory, through sources which we can happily trace, they fell back upon the unworked patent of Dubrunfant, and claimed priority.

In 1842, Edward Price and Co. took out a patent in the name of Mr. W. C. Jones, a working chemist, whom I had brought in as an assistant, for distilling cocoa-nut oil and its acids, and also for converting them into a neutral substance by distilling them after combination with lime.

Candles, beautiful in appearance, were made by distilling the cocoa-nut acids, but on putting them out, they gave off a choking vapour, which produced violent coughing. We consulted my old master, Professor Daniell, of King's College, upon this, who gave it as his opinion that the vapour was that of the fat acid itself, and recommended us to try dowters, the old-fashioned flat snuffers, hoping to extinguish the candles instantaneously. This lessened the evil, but did not entirely remove it; the candles were therefore never brought into the market.

Under the last part of this patent, distilling cocoa-nut lime soap, we made beautiful candles, resembling those made from paraffine, burning perfectly, but the loss of material in the process was so great, that the subsequent improvements superseded its use.

Under one part of this patent the distillation was carried on, sometimes with the air partially excluded from the apparatus, by means of the vapour of water, sometimes without, the low evaporating point of the cocoa-nut acids rendering the exclusion of the air a matter of much less importance than when distilling other fat acids.

It was during experiments connected with this patent that Mr. Jones and I first tried using vapour of water to exclude the air from the apparatus during distillation.

In distilling the cocoa-nut acids, combined with lime, in a small gun-metal retort, we found that the product of distillation was light-coloured only so long as the water mixed in the lime soap distilled along with it. We then fixed a cup on the top of the retort, out of which water slowly dropped; this produced the anticipated effect of increasing the yield of light-coloured material.

In 1842, E. Price and Co. took out a patent in the name of Mr. Jones and myself, the principal claims of which are the distillation of fats previously acted on by sulphuric acid, or by nitrous gases. This patent contains an original mode of acting upon fats by sulphuric acid at a high temperature.

M. Frémy, in his valuable paper in the "Annales de Chimie," describes treating oils with half their weight of concentrated sulphuric acid, by which their melting point was greatly raised. He gave, however, particular directions that the matter under process should be kept cool. Instead of doing this, we found it advantageous to expose the mixture of fat acid and fat to a high temperature, and we still do so. M. Frémy lately informed me that he is again at work upon fatty bodies. I need hardly say, that so able a chemist cannot work in vain on a subject he is so well up in.

While Mr. Jones and I were experimenting under this patent in one part of our works, Mr. Gwynne was at work in another, with a small silver retort connected with an air pump. His object was our carrying out on a large scale his patent of 1840 (under which we had taken a licence), but finding that steam excluded the air as effectually as the air pump, and with much fewer manufacturing difficulties, we combined our forces upon this, and in 1843 took out two patents for improvements in the processes and apparatus, under which part of our manufacture is still carried on.

In 1844, E. Price and Co. took out a patent for the use of diluted acid in direct acidification of fats. I only mention this on account of having heard that the idea has been lately revived in France.

Our process of sulphuric acid saponification was as follows. We still employ it, and in some cases reduce the quantity of acid employed to 4lb., and even 3 lb. to a cwt. of the fat. Six tons of the raw material, usually palm oil, though occasionally we work cheap animal fat, vegetable oils, and butters, and Japan wax, were exposed to the combined action of 6¾ cwts. of concentrated sulphuric acid, at a temperature of 350 Fahrenheit. In this process the glycerine is decomposed, large volumes of sulphurous acid are given off, and the fat is changed into a mixture of fat acids of a very dark colour, with a high melting point. This is washed, to free it from charred matter and adhering sulphuric acid, and is then transferred into a still, from which the air is excluded by means of steam. The steam used by us is heated in a system of pipes similar to those used in the hot-blast apparatus in the manufacture of iron, the object of heating the steam being only to save the still, and reduce to a small extent gaseous loss in distillation. On the table are specimens of this process.

1. The palm oil fruit, for which I am indebted to the kindness of Sir Wm. Hooker.

2. The raw palm oil; it is, you see, of a bright orange red colour, and of about the consistence of butter.

3. The palm oil, after the acid treatment and washing. You see it is almost black, and very hard.

4. The last product distilled.

5. The residuum of distillation.

Thus, you see, distillation separates the black acidified palm oil into the pure fat acids, which come over in vapour, leaving the charred matters, and other impurities which are not volatile, behind in the still. All who have blown out a candle know the unpleasant smell of fatty matter distilling in contact with the air. That tallow candles give off a more offensive vapour than stearic ones, is owing to the presence of glycerine.

We have stills bringing over their charges of above five tons without any unpleasant smell, owing to all access of air being excluded. The distilled material is either used for making the cheaper descriptions of candles, or is subjected to hydraulic pressure, first at the temperature of the air, and then at a high heat.

That which remains after hot pressure, is used, after removing by diluted acid any rust it has taken up from the iron press plates, for making what are known as Belmont Sperm Candles.

Our brothers across the channel, with their many good qualities, understand how to make the most of themselves, as they themselves term it, "se faire valoir."

At the Exhibition of 1851, a French firm appeared as competing with us for the honour of the introduction of practical fatty distillation and sulphuric saponification. The case they made, though it did not gain them the Council Medal, told very much against our getting it.

It was impossible not to be impressed with the number of kilogrammes they worked weekly, the low quality and cheapness of their raw materials, and the description of their workings, given by two distinguished French chemists, in a valuable chemical work. Their products were nothing very striking. Within six months of the closing of the Exhibition, it appeared that, notwithstanding the number of kilogrammes worked, the cheapness of the raw material, and the tribute of the chemical book, the undertaking was unsuccessful; the manufactory was put up for sale at a price considerably less than the first cost of its machinery. My brother went over to see it, and one great reason why we did not buy the place was, that the apparatus was so imperfect, that it would have been cheaper for us to put up new plant than to perfect that which had been employed.

We had, thus, now arrived at a process by which the fat acids were set free from the glycerine, with but small cost for the chemical agents employed; and these fat acids, by the after-process of distillation, converted into valuable material for candles. This was a great move forward. The process, however, involved waste of the glycerine, and a considerable loss of material, owing to decomposition of a part of the fat acids.

I have now to direct your attention to processes intended to overcome these last-mentioned defects.

In January, 1854, Mr. Tighlman, an American chemist, who has studied all that has been published here and in France, on the subject of acidification and distillation of fatty bodies, obtained a patent for exposing fats and oils to the action of water at a high temperature, and under great pressure, in order to cause the combination of the water with the elements of the neutral fats, so as to produce at the same time free fat acids and solution of glycerine. He proposed to effect this by pumping a mixture of fat and water, by means of a force pump, through a coil of pipe heated to about 612 Fahrenheit, kept under a pressure of about 2,000 lbs. to the square inch; and, he states, that the vessel must be closed, so that the requisite amount of pressure may be applied to prevent the conversion of water into steam. This is, as all must admit, a beautiful, original, chemical idea, well carried out; it has yet to be proved how far it can compete successfully with distillation. We have made an arrangement with Mr. Tighlman which will give us the means of testing its commercial merits.

I went with my chemist-assistant, Mr. Payne, to see Mr. Tighlman's little apparatus at work, and in the course of some experiments which it led us to try, or rather to try over again, it struck me that steam, passed into the fat at a high temperature, should effect by a gentle process what Mr. Tighlman aimed at effecting by a violent process, the resolving of the neutral fat into glycerine and fat acids. We proved that this was so, and that the glycerine distilled over in company with the fat acids, but no longer combined with them.

In July, 1854, we took out a patent for this process, by which many hundred tons of palm oil and other fats have now been worked, and which has given to the arts and medicine a body never before known, either in France or here, even in the chemists' laboratory, glycerine, which had passed over in the form of vapour, without a trace of decomposition.

I did not see why glycerine, if it would distil once, should not distil again; experiment showed that it might be re-distilled. We took out a second patent for this, and now use this process in place of all other modes of purifying glycerine.

In the old days, glycerine was looked upon as a nuisance, something to be got rid of at a great expense; it now proved to have been only the right man in the wrong place—for artificial purposes, that is—for in nature nothing is in the wrong place. The despised glycerine is now more valued, and sells at a higher rate, than its early-prized associate, the stearic acid. We have reason to hope for great results from these new processes; before them the glycerine sold even at a very high price, more than three times the present price, was not pure, and the generality of specimens were very impure.

At the suggestion of the Vice-President who this evening occupies the chair, I read a paper at the British Association meeting in Glasgow, in which endeavour was made to bring forward all the information which I could collect respecting this as yet little-worked body. As the paper was copied into our Society's *Journal*, on September 28th, 1855, I may assume that members likely to be interested in the subject saw it. I will, therefore, spare you the infliction of going over the ground again, merely reverting to those points which have received any development since the date of the Glasgow paper.

Mr. Startin, to whom glycerine owes so much, from his having introduced it in 1844 into the Hospital for Skin Diseases, from whence its use spread, has kindly furnished me with the particulars of a great number of medicinal

uses, which were new to me, and many others in which he had anticipated M. Cap. These are set out at length in the *Medical Times*, vol. 21, p. 27, January 12th, 1850. He also informs me that the notion of its use as an embalming agent is an old one, its antiseptic properties having been one of his earliest observations. When the young hippopotamus first came over, it was arranged between Professor Owen and Mr. Startin, that, should it unhappily die, glycerine injected was to be used for its preservation.

In photography, Mr. Maskelyne, of Oxford, tried a number of promising experiments with distilled glycerine. Other engagements interfering, he passed the subject over to Mr. J. D. Llewelyn. That gentlemen has favoured me by communicating his present views in the following words, which, coming from so distinguished a photographer, I am happy in being allowed to quote. He writes, "I have made now about 200 carefully-registered trials, and continue to be persuaded that it will prove a most valuable photographic agent. In conjunction with honey it works admirably, and is thus an important improvement on Mr. Shadbolt's process, rendering the preservation film far more soluble in water than the honey alone." In medicine, I am informed, that all fear of danger from internal administration is over. One of the principal Edinburgh druggists writes, that the medical men are prescribing it in doses of three desert, and even three table-spoonsfull daily. This is not the place for medical discussions, and if I went into cases, perhaps some members present might be induced to doctor themselves without previous competent medical advice, of which I must beg to decline the responsibility. As a cure for chapped hands, it keeps constantly growing in favour.

I have never seen it tried on a burn, but I lately received a letter from a gentleman in Liverpool, which stated that, applied on a severe scald from boiling water, it acted as an immediate charm, and when the surgeon arrived he was astonished at the effect produced.

Dr. Davy has kindly favoured me with the information and the permission to mention the fact, that Sir John Richardson has lately used g'ycerine with benefit in cases of confluent small pox; applied to the face, he believes it retarded the eruption, and had the effect of diminishing the pitting on healing. I have also heard of its application in cases of erysipelas with reputed good effects.

Since the above was written, I have been favoured with a letter from Mr. A. W. Dickson, of Edinburgh, giving the particulars of a case of affection of the mucous membrane, which occurred in his practice, in which glycerine was given, a table-spoonful three times a day, and appears to have worked wonders. He informs me, too, that the well-known Dr. Simpson is anxious to settle the question of the fattening powers of glycerine, and for that purpose makes a proposal which we shall willingly accept. Dr. Simpson is to get a litter of pigs, to give glycerine freely with the food to two of them, cod liver oil to other two, and the ordinary diet to the others, and weigh them from time to time. The doctor offers to stand the pigs and the watching, if we stand the glycerine, which, for such an object, we shall gladly do.

It ought to be useful in making infusions and extracts. You will observe the brilliant colour of the liquid at the top of the bottles, containing passion-flower fruits, reaching about an inch down; and any member who likes to taste, or even to smell the glycerine in the glass-jar containing apples, will perceive that the apple flavour has been extracted. Its power of preserving the colour of animal and vegetable substances is shown by the specimen on the table. The roach and perch, (see the labels on their bottles), have been immersed since July and August; their colours are still quite bright.

The Rev. John Barlow, F.R.S., has very kindly allowed me to exhibit his specimens of beefsteaks preserved in glycerine. Mr. Barlow's well-known experiments on this subject are detailed in his paper, read at the Royal Institution, on March 30th, 1855.

The bananas were immersed on the 1st October. The unripe green colour which, exposed to the air, changes to yellow in a day or two, is here preserved; the flowers were put in on December 3; you will perceive that many of the colours are bright; the Cape gooseberries, put in October 30, are perfect. For the specimens of English-grown bananas, for the fine apple, and the Cape gooseberries, and for the two vases containing various flowers, I am indebted to the kindness of Lady Dorothy Nevill; her ladyship informs me, that in her experiments in preserving fruit and flowers, she finds that glycerine diluted with twice its bulk of water gives the best results.

Sir Wm. Hooker favoured me with an account of his experiments upon preserving delicate fruits in glycerine. At first it promised well; he found glycerine mixed with an equal portion of water, to give better results than concentrated glycerine; the longer trial, however, showed it to be, for his purposes, inferior to pyroligneous acid.

On the table are specimens of the principal descriptions of candles manufactured by the Company :—

Belmont sperm—made of hot-pressed, distilled palm acid.

Belmont wax—the same material, tinted with gamboge.

Best composite candles—made of a mixture of the hard palm acid, and stearine of cocoa-nut oil.

These last candles are not hard to the touch, or fit for use in hot climates, but give, perhaps, a pleasanter light for reading by than any other description of candles, the larger proportion of hydrogen in the cocoa-nut correcting the reddish light of the palm acid.

Composites Nos. 1, 2, and 3, are made of palm acids, and palm acids and cocoa-nut stearine, the relative proportions varying according to the relative market prices of palm oil and cocoa-nut oil, at the particular time at which the candles are manufactured.

No. 4 composite is a description of candles we have very recently introduced, intended to supply a want caused by the present very high prices; a candle giving a good light, and yet to be bought at very little above the price of tallow dip candles; they are, as will be seen, of a very dark colour.

Candles are commonly packed in single pounds by the foreign manufacturers; these packets now usually contain candles weighing only from 13 oz. to 15 oz. The Company are about to adopt two sizes of packets for the export markets, where they meet the foreign manufacturers, one labelled prominently as weighing 1 lb. of 16 oz; the other labelled prominently as weighing $\frac{3}{4}$ lb. or 12 oz., of a smaller size of candles. It may be hoped that this will restore the original pound packets; at present they are going the way bottles have gone.

I should not have said anything about what is now an old story, the use of arsenic in candles, its use and the object of its use having long ceased, had it not been for the fact that when the English public once gets an idea into its head, there is great difficulty in getting it out again; and that I lately heard it said that Sir Edward Belcher, in his last Arctic expedition, believed that his crew suffered from candles giving off arsenic. Many years ago it was believed, and said, that when stearic candles were first lighted there was no escape of arsenic, but that when the candles had burnt nearly down, the arsenic having settled to the bottom, gave off a most offensive vapour. The fact that the top of the candle, when burning, is the bottom of the candle when in the mould, where the supposed settlement must have taken place, rather disturbed this theory. Probably, the candles used in the expedition were of a common description, and gave off, not arsenic, but smoke, which candle smoke, in a confined situation, is most unpleasant, and quite sufficient to produce nausea. I think it hardly possible that the candles could have contained arsenic. The reason for the use of arsenic, in the old days, was this—the candle material used to be poured into the moulds at so high a temperature, about 240° Fahrenheit, and was so long in congealing, that crystallization of the stearic acid

would have taken place and disfigured the surface of the candles, had not some means been employed to prevent perfect crystals being formed; the means at that time employed were wax, or a small quantity of arsenic and wax, which gave a compact homogeneous appearance to the candles.

In modern candle-making the material is poured into the moulds at so low a temperature that congelation has already begun, which prevents the formation of perfect crystals more effectually than arsenic and wax ever did; there is now absolutely no more object for introducing arsenic into stearic candles than for introducing it into tallow dips.

I am sorry not to be able to give information worth anything as to the candles shown in the Paris Exhibition, though I very carefully examined them.

The processes of stearic manufacture are now so far advanced that any manufacturer can, even on the large scale, produce and exhibit stearic acid chemically pure; the whole question, therefore, turns upon the cost of manufacture. This cannot be arrived at until the jury reports are published, nor even then, I fear, with any degree of certainty; it is only in quite exceptional cases that manufacturers will so far disclose the secrets of their manufacture as to give anything like accurate data for comparison.

As to the Company's manufactures exhibited, and the gold medal of honour which they did, and the great gold medal which they did not, receive, I propose to mention the bare facts as they occurred, making no comments. There was much discussion in Paris on the awards. I have no doubt of the accuracy of the following information, which I gleaned from various sources. The Company were invited to exhibit in a building, the name of which is "Palais de l'Industrie." They were informed that their products would be submitted to the judgment of the jury, the group of juries, and the council of presidents. They exhibited specimens of a chemical manufacture raised by them, now carried on on an immense scale, and also specimens of a new chemical process fully developed, and at work on the large scale, and which gave results, one of which even Chevreul never foresaw, and which had never before been seen in France—pure distilled glycerine.

The jury, the group of juries, and council of presidents, awarded the highest recompense of the Exhibition, the "*grande medaille d'honneur*," and a notice was sent by M. le Play, the French commissary-general, directing that the Company's specimens should be moved from their position in the Annexe into the nave, to be brought under the notice of the Emperor, which, I am told by jurors, is something very like equivalent to an official notice of the highest recompense having been awarded.

At the last moment, a new tribunal, the Council of Seven, was established; this first passed the medal awarded to the Company, and then transferred it to M. Chevreul, who does not appear as an exhibitor, giving the second gold medal of honour to the Company. I am told by French friends that the Council of Seven were placed in a position of difficulty, owing to too many great medals having been awarded by some of the juries.

The English commission were good enough to break the fall, as far as lay in their power to do so, by admitting the Company's specimens into the English trophy at the grand closing scene, so that Belmont was, after all, well represented by its stearic candles seven feet high, towering above everything and everybody.

These international exhibitions, while they often create soreness, seem to do good, by bringing people of different nations in contact. Our perhaps keenest French opponent at the Exhibition of 1851, is now a friend, whom my brother and I are anxious to serve, as I believe he is to serve us.

Another considerable branch of the Company's manufacture is night-lights. Before 1848 we made these in but very small quantities.

In 1848, we commenced manufacturing under Mr. Clarke's patent, with improvements introduced by ourselves.

In 1849, we made an arrangement with Mr. Childs for purchasing his machinery and business, and commenced manufacturing the night-lights known as Childs' night-lights. Between these two descriptions of night-lights we organised a manufacture on a sufficiently extensive scale to give us the power of selling night-lights with profit to ourselves, at prices at which they could not be produced on a small scale.

On the table are specimens of a newly-invented description of night-lights, which we believe will remove the one great defect of the existing night-lights—the flickering of their light.

The excise laws, utterly bad as they are, have on many occasions, like necessity, been the mother of invention. The heavy cost of paper, loaded as it is with 1½d. a lb. of duty, led to Mr. Geeves inventing a mode of cutting wood in slices thin enough to serve as an efficient economical substitute for paper. These were applied by Mr. James Childs to night-light casings, and are now cut on a very large scale by the Company, and used in the place of one surface of paper for their night-light covers.

On the table are specimens of the shavings, four feet by one foot, 160 cut from an inch plank.

The heavy paper duty puts a bar on our making the paper cases so generally used by the French manufacturers for their 1lb. packets. In our manufacture as it is, we paid last year 1½d. a lb. duty on 358,272 lbs. of paper, amounting to £2239, with the extra 5 per cent. to £2350; but, perhaps, in the present time, we ought rather to be thankful for the soap excise having been removed, than to grumble at the paper one which remains.

Another extensive branch of the Company's manufacture is oil—for burning, for lubrication, and for oiling the wool used in the great cloth mills of Lancashire and Yorkshire.

This manufacture has afforded room for many applications of chemistry. I could tell little, however, that would be otherwise than utterly uninteresting to a general audience. I will, therefore, confine myself to a very few words upon the last branch.

The applications of oleic acid to the purpose of greasing wool, was originally a French invention, patented in this country. We adopted it, and have added some important recent improvements; it is a part of our business upon which care and labour has been bestowed. Had this substitute for olive and rape oils not been introduced, the failure of the olive crop, and latterly the high price of rape oil, would have entailed a serious charge on the cloth manufacture.

The French moderator lamps are now deservedly in so extensive a use, that I thought it might be interesting to those members who do not understand their construction, to have the opportunity of seeing one with a transparent pedestal, allowing the works to be seen. Messrs. Pearce, of Ludgate-hill, kindly lent me a lamp for this purpose; the oil burning in it is rape oil imported by them.

The only drawback I know of to the moderator lamps is, that with some of the shades used, they hurt the eyes when used to write by,—at least my lamp does.

I must say a few words about the Crimean army stoves and lanterns, which, last year, formed a not very small branch of the Company's manufacture; they were contrived, in haste, to supply the very urgent want for a not very expensive portable fuel for giving warmth and cooking power for the army in the East. Delay, perhaps partly unavoidable, prevented their getting out in time to be of any great general service. We continue, however, to receive reports from officers expressing themselves most warmly as to their merits, especially speaking of the lanterns. I should wish to guard against its being conceived that they were ever intended for use where the more economical sources of heat, such as coal or gas, could be procured. The only one of the inventions which we

brought out at that time, which seems at all likely to survive the emergency which gave it birth, is the candle stove, of which a specimen is on the table. This was contrived on Mr. Brunel expressing a want for some arrangement which would give a supply of hot-water in different parts of the hospital, at Smyrna, which he had the charge of erecting.

I think for those occasions where coal is expensive, or where a chimney is impracticable, there is, perhaps, more heat in proportion to the products of combustion given off in this way than in any other, with the exception of spirit lamps.

Since this was written, Col. Sir Charles Shaw has confirmed this opinion, and has suggested a very promising modification of the arrangements applicable to the purpose of cooking for the army, in countries where wood fuel is not easily procurable.

We have almost succeeded in perfecting an economical candle lamp for the railway carriages; there is a specimen of the lamp and the dumpy candle on the table.

I beg to call attention to the flower vases on the table, ornamented with crystals of the palm acid, palmitic acid, deposited between two surfaces of glass.

I have now finished the account of the Company's products. As my former paper was attempted to be used to the disadvantage of the company, I may be allowed to guard the present one, by drawing attention to the fact that the Company's dividends do not exceed a fair manufacturing profit on the capital invested, and that their new machinery now completed is sufficient to supply any possible demand for their products. Connected with the manufactures of the Company, are the endeavours they have made to raise up a set of improved and contented workpeople. This comes hardly within the scope of the present paper, nor, indeed, within my department of the business, it having been originated by my brother, and worked by him, aided latterly by the very liberal grants of the Company.

I will merely mention that the educational and improvement work is going on most happily at the London factories, and in our recently established colony on the Mersey, the new Bromboro' Pool Works.

It has always been the endeavour of the Company to encourage and assist, as far as possible, the introduction and importation of new fatty materials, vegetable and animal; they may take this opportunity of making their acknowledgments for the very valuable assistance which the Kew Museum has afforded them, and for the full, prompt answers Sir Wm. Hooker has always given to all applications respecting new oil seeds; to Dr. Royle, for his valuable information respecting Indian products; and to Miss Gurney, for the very useful information she has obtained respecting the oils and oil seeds of Western Africa. A few years back, at the suggestion of Sir Wm. Hooker, I noted down a few simple directions, some of which I propose to repeat, in the hope that, through the medium of our *Journal*, they may reach some member of this now widely-spread Society, who may be in a position to aid the object I had in view.

"In times of peace, with tallow at average prices, every oil, or grease, whether solid or liquid, if not poisonous or acrid, like croton oil, or viscid and gummy, like castor oil, or drying, like linseed oil, may be considered to be worth in London at least £30 a ton. Among greases solid at above 60° Fahrenheit, the higher the melting point (other things being equal), the greater the value; for example, the vegetable tallow of Borneo, melting at about 90° Fahrenheit, is worth at least £5 a ton more than the cocoa-nut oil of Ceylon, melting at 70°. It is difficult to say to what extent the soap duty having been taken off may change the relative values of greases; but, in peace times, liquid oils like the ground nut are worth more than soft solid oils, like the Bassia butter of India, as they require less manufacturing to fit them for use, the liquid oils, after a simple treatment in a cheap apparatus, being fit for burning in lamps, while the soft solid oils, being neither hard enough for use in candles, nor liquid enough for use in lamps, require to go through a press before they are saleable, except for soapmaking. Greases may have particular advantages, such as being little acted upon by the air, and therefore not easily becoming rancid, good qualities, which can only be ascertained by experiments, which we shall be happy to try. The value of oil must depend a little (especially when found in out-of-the-way places) upon the way it is held in its matrix; for example, the oil of the Lumbang nut can be separated with much less labour and simpler machinery than the cocoa-nut oil, which requires very great pressure to extract it from the copperah, or dried cocoa-nut kernel.

"Waxes are worth more than greases, on account of their very high melting points; their relative values depend upon colour, transparency, and freedom from resinous matter. Resin may be easily detected by lighting a small piece of the wax; the more smoke, the greater proportion of resin, and therefore less value; the paler and more transparent the wax the better. The most valuable tree-wax yet known is the beautiful insect-wax of China.

"A simple way to try an oil nut is to crush it with a stone, and then squeeze it between your finger and thumb; if it contains any considerable quantity of grease, enough will be pressed out to judge of colour, hardness, and sweetness; if the nut tastes oily, and yet oil does not come out by this treatment, it is well to dry the kernel before squeezing; and, in the case of nuts containing grease solid at a high temperature, it is well also to previously heat the nut. When a stearic candle can be got, burn it down a little until it has formed a cup, then blow it out, place into this a little of the material to be tried; after a moment's burning, the candle material with which the wick is saturated is burnt out, the new material to be tried in the cup takes its place, and becomes the material supplying the wick until the cup is emptied, and so can be judged of. The candle on the table, you see, is burning well; the small quantity of linseed oil I now drop in the cup at once makes it smoke, or a piece of string dipped in the oil or melted grease makes a very tolerable wick, or, simpler still, where the nut is very full of oil, if lighted at one end, it will at least show what tendency to smoke there is, and the colour of the light.

"Some of the resins ought to come in for candle-making, though I believe that they have never been extensively used, except for the commonest sorts of candles, on account of their giving off so much smoke; but as some descriptions smoke less than others, there is a hope that new ones may be found which smoke still less; these would then be very serviceable for candle-making. The points connected with new greases, &c., that we should be most thankful for information upon, are, the manner of growth, probable expense of collecting, means of transport, and quantity likely to be obtained, with small specimens of the grease, if manufactured, and of the fruit, with both its husk and hard shell, where these exist.

"In order to avoid the delay which has taken place in ascertaining the value of new oil seeds on a commercial scale, the Company has just arranged for a small, complete set of crushing machinery, applicable to the purpose."

I believe that, as yet, we have had the benefit of but a very small number of the oils and fats which will hereafter be brought in in great quantities.

The Russian war is putting the screw on the oil collectors all over the world. It requires time before their efforts tell to any great extent; however, some fats and oils, which used to make their appearance in single tons, now come in in larger quantities, and the importation of the old oils, such as palm and cocoa-nut, is greatly increasing. Some of the useful fats, which are known to be obtainable in very large quantities, like the Bassia butter of Central India, seem almost unaccountably long in coming in in quantity.

Among all the very many specimens of different oils and fats we have experimented upon, with the exception of the three palms, the cocoa-nut, the cahoun, and the

palm oil palms, the kernels of which yield oils seemingly identical, every oil and fat seed appears to yield its peculiar oil or butter; the varieties seem endless.

I have now come to the end of the paper. I have endeavoured to show how the object with which we started, the separation of the glycerine, has been attained by successive improvements, which have reduced the sulphuric acid employed from 32 lb. to 6 lb., from 6 lb. to none. It might appear that fat acid improvements were exhausted. I may say, from personal experience, that of each year of the fourteen in which I have been engaged in this work, including the year just past, there seemed a wider future at its end than at its beginning. It causes at once the charm and the care of all chemical manufactures, that from their nature they can have no end; the refuse of one year may be the most valued product of the next; as in all other pursuits, involving researches into the works of God, we see around us wonderful wisdom and order, and variety, and before us a field for man's labour until the end of time.

DISCUSSION.

The CHAIRMAN said, he was sure the meeting must have been pleased at the description given them of the various processes used by Price's Company, which had now become one of the institutions of the country. He was sorry, however, to find that there was no "Mr. Price." He had pictured to himself some venerable ancient, fattening on his well acquired gains, and passing a contented old age somewhere about Vauxhall, but it appeared he was only a kind of Mrs. Harris. The more credit, however, was due to Mr. Wilson and his father for the establishment of this important Company. If they allowed him to call their attention to a few facts, they would probably be the better enabled to follow the discussion. All fats were composed essentially of two parts—fatty acids, and a base—as common salt was composed of muriatic acid and soda. Tallow, however, contained three acids, the stearic, margaric, and oleic. Candles were of two descriptions—those containing the glycerine, and those composed of the acids alone. They would observe, from the specimens before them, that the oleine did not give so good a light as the others, whilst at the same time it was liquid, burnt at a reduced temperature, and gave less light. Before the separation of the glycerine, the great object had been to get this liquid out of the ordinary fats, and this had been accomplished by pressure, the candle material being submitted to a moderate heat, so as to liquify the oleine, but not the other constituents. It was afterwards felt that it would be an advantage to get rid of the glycerine, which, in itself, gave but little light, and lowered that produced by the fatty acids. Here they came to observe how tardy they had been at arriving at the simplest method—a fact which was observable in all discoveries in chemistry—or, he might say, in science. It appeared as though the human mind could not compass the simple operations of nature, but must go in a complex manner to arrive at a given point. The truth was, they were in an unknown field, and, not knowing the road through it, they went by zig-zag courses, until, after a tedious exploration, they discovered both ends of the field, and then saw that the direct road across would have been simple and short. In the first instance, to get rid of the glycerine, chemists were compelled to produce a soap by the union of lime, and afterwards to procure the acids by decomposing the soap. Many processes had been applied, and he remembered, in his early days, he considered he had achieved a great triumph when he obtained glycerine out of fat. Indeed it was one of the tests of preparation that used to be set to young chemists. Now Price's Candle Company obtained the required result by simply blowing steam at a high temperature through the fat. The applications to which glycerine might be put were very numerous. They saw it might be used for the preservation of fruits or provisions —it was most valuable for medical purposes—and he might inform the ladies that it was stated to be an admirable cosmetic. It is said to improve the appearance of the skin, and, unlike other cosmetics, it was not deleterious. He had no doubt there were gentlemen present who could give them some valuable information relative to its applications, and he would, in the first instance, call upon Mr. Startin, the surgeon to the Hospital for Diseases of the Skin.

Mr. STARTIN said that it was about 13 or 14 years since his attention was first directed to the value of glycerine for medical purposes, the more especially with regard to skin diseases, to which he had given his particular attention. He found that it kept moist, and allayed the irritation generally consequent upon skin diseases. Getting on by degrees, he administered it internally in states of the stomach and system where fermenting saccharine matters could not be borne. He used it extensively in lotions and other outward applications, to preserve these remedies from fermenting or spoiling, and to keep them moist upon the skin. It was a capital antiseptic, which, at an early stage of his observations, he discovered accidentally in the preparation of poultices, one of which, on being placed in a cupboard, was found three months afterwards perfectly fresh. Glycerine was also most valuable in the preservation of different things, medicines, extracts, pills, syrups, &c., and in some kinds of food, as in the preparation of bacon and other salt meats. By the addition of 1lb. of glycerine to the usual ingredients used in the salting of one or two cwts. of meat, it would add to its flavour and prevent the meat from hardening or fermenting, so that it would be more agreeable to soldiers, sailors, and others, who had to depend, in a great measure, upon salt meat and fish. He had not yet made it public. He had also mentioned to his friend, Dr. Andrew Smith, of the Army Medical Board, that he had found glycerine the best remedy for frosted limbs. It contained the elements both of a spirit and an oil, and seemed to unite with the skin itself, and render it elastic and capable of resisting low temperatures, which properties would prove of the greatest importance in the treatment of frost-bites. These, and a great number of other uses, he had published in the paper referred to by Mr. Wilson, *Medical Times*, Vol. 21, for the year 1850, where also the manner of using this agent would be found,—which he would only here mention, for the most part requires to be diluted before it is applied for medical purposes.

The CHAIRMAN was happy to find the gentleman present who had drawn up the jurors' report on this subject for the Exhibition of 1851. He would be glad to hear any observations relative to it from him.

Mr. WARREN DE LA RUE, F.R.S., did not think he could add much to the lucid explanations of his friend, Mr. George Wilson, and the Chairman. In the Paris Exhibition of 1855 it was extremely flattering to him as an individual to find that all the real improvements since 1851, in this branch of industry, had taken their growth in England. In no instance was it more apparent than in the display of Price and Co. It was true there were in the cases of other manufacturers the results of processes based upon economy. In Mr. Milly's case there were some admirable products from lime saponification, a peculiarity being in the small quantity of lime employed. There were also some good specimens exhibited by Mr. Boyce. Mr. Tighlman had shown how fatty substances might be prepared, and the glycerine set free by distillation, at a high temperature under great pressure, but he believed Mr. Wilson's to be the better plan, viz., by the passing of steam through iron pipes, by which the substance acted upon became super-saturated, and the glycerine was set free without any great amount of pressure. It was gratifying to find that amidst the cry of the decadence of science in England, there was one branch in which the experiments commenced in France had been improved upon in this country, and the result carried out so as to produce a splendid commercial prosperity. And this instance might be cited as a set off against other cases in

which we were falling behind our neighbours. It was gratifying to find that Englishmen were not the only parties who gave short measures. This was one of the natural consequences of the desire for cheapness. Mr. Wilson had briefly alluded to the unfortunate circumstances relative to the great gold medal of honour. It was the unanimous opinion of the English jury that it was due to Mr. Wilson. It appeared that the directors of the Exhibition had formed two peculiar views with regard to those medals, one being that the scientific man who first started the idea of an invention or improvement in manufacture, or by discoveries in science, laid the foundation for it, should be entitled to the medal, even though he was not an exhibitor. On this principle their own countryman, Faraday, obtained a high rank in the Legion of Honour, though it had not pleased our rulers to recognise in England the honour justly given to him by France. As it was, Messrs. Price and Co. must be content with the lustre cast upon them through M. Chevreul's medal, and the knowledge of the high position they had attained. He believed that glycerine was destined to play a most important part, both in medicine and in the arts, and it was due to Mr. Wilson to state, that fine glycerine had never been commercially obtained until produced in his manufactory. Though Mr. Startin might fairly claim the merit attached to the application of glycerine in the cure of skin diseases, he must be allowed to claim for his father the merit of having first suggested its use, at the time when Mr. Hennell was at Apothecaries' Hall.

Mr. STARTIN had forgotten to mention in his observations that he was so indebted, though it gave him great pleasure to acknowledge it.

The CHAIRMAN asked whether Mr. De la Rue was aware that sebacic acid had been produced at a cheap rate by the distillation of castor oil and with potash, and also capryllic alcohol, which was very useful for dissolving varnishes; and, if so, if it had been produced in large quantities; because sebacic acid, which melts at a high temperature, might be usefully employed for mixing with easily fusible fats.

Mr. DE LA RUE was aware that such products had been exhibited at Paris last year, and though they had been produced in comparatively large quantities, they had not yet been manufactured on such a scale as would extend their uses.

The CHAIRMAN observed an allusion in the paper to his old friend, Colonel Sir Charles Shaw, as to arrangements made through his suggestion for the benefit of the army, and he should be glad to hear any remarks from the gallant officer.

Col. Sir CHARLES SHAW felt it would be somewhat difficult for him to speak to men without arms in their hands, and if, therefore, he made any mistakes, they must excuse him. Before he had the honour of knowing Mr. Wilson, his attention had been called to Price's candle lamps. It occurred to him that what was good for the officers would be good for the men. He then went to all the shops where he saw supplies for the Crimea, and the first thing he saw was a large japanned case, formed like a knapsack. He tried to put it on, but he was told it was not intended to be so worn, but to keep the clothes in. He replied that it was the internals that wanted most looking to, and if men were well fed they were like cats, who were said to have nine lives. He next found out that the average weight now carried by the soldiers was much below that which they carried in the war in the Peninsula. He next gave Mr. Wilson an idea of what would be of service to the soldier, and he was yesterday called upon to inspect what he believed would save the lives of thousands of soldiers and millions of money to the country. He saw 150 pints of water boiled by a portable fuel, the carrying of which would add very little to the weight already carried by the soldier. If last winter they could have obtained for their army sufficient fuel, it would have saved 20,000 men from dying, and £3,000,000 of money. He was obliged to take into consideration the money value of the lives of their soldiers. There would not have been one-fiftieth part of the sickness in the army last winter but for the want of fuel; and he believed that if the troops were ordered to march from their present quarters, they would be in as bad a position as ever, and the same miseries would be experienced. This, however, could be remedied by the aid of Mr. Wilson's fuel, and that at no great expense. A regiment was composed of 10 companies, each consisting of 100 men, and he looked upon the money value of each soldier as £200. After a few days' march, 1,000 men would be generally reduced to 600, owing to their straggling to obtain fuel to cook their food. Some people had an idea that soldiers died from shot and wounds. It was not so. Col. Leech, in his book on the last war, said, that whereas 40,000 men were killed on the field of battle, or died of their wounds, 120,000 died from disease, and an additional 120,000 were disabled by illness. In the navy, during the same war, 6,000 men were shot, 13,000 died from their wounds, and 72,000 by disease. He wanted to know what was the use of the Minié to men without food—and what was the use of food without fuel to cook it. Now 14 lbs. of Mr. Wilson's candles would cook for 100 men for more than a fortnight, and would not cost one-third the price of ordinary fuel. In Russia, during the last fourteen years, more than 2,000,000 of men passed through the hospital; but they did not know how many came out. A few years since he had the command of a brigade of 1,500 men of the Spanish legion. Upon halting at the conclusion of a day's march, his number was reduced by stragglers to 1,100. He refused to sign for rations for more than were with him. There was nearly a mutiny; but he was firm, and when the stragglers came up, they were fed by their comrades. The next day the stragglers were reduced to 200, who expected to be fed by their comrades; but in a few days there were none at all. They had heard a great deal about the habits of soldiers, and the plunder at Kertch. Why that plunder was only to obtain fuel to cook their victuals. In Oporto libraries were burned for the same purpose; and the greater opportunity they gave the soldier of cooking his food, the more would he be improved. If they observed the French soldier, they would notice the *marmite* at the top of his knapsack, and a faggot of wood—that was to enable him readily to cook his food; but though this provision was made, the French soldier was not otherwise well provided. It had been said that we, as a nation, were slow to adopt novelties. This was no doubt true to a certain extent; but when once we were convinced of the advantages to be derived from any particular invention, it received greater development and encouragement here than elsewhere. As an illustration, he might mention, that though the Minié was a French invention, and was perhaps long in being adopted in our service, yet the British army in the East, though not half as strong as the French, had yet more than double the number of Miniés. The best mode of improving the *morale* of the soldier was to take away from him the temptation to plunder. If a soldier was obliged to look for fuel before he could get his breakfast, he would tear down a door, or anything that came in his way. Before he had the pleasure of knowing Mr. Wilson, he saw a pamphlet relative to the plans of education adopted in his factory, and he sent it out to some of his brother officers, recommending them to introduce it into the army. Soldiers could only be made by labour and experience; and the present mode of making them was a good example of the simile of their Chairman,—they would go round a circle instead of looking for the most direct and simple road.

The CHAIRMAN was tempted to mention an invention he had seen at Paris for cooking by friction. It was by a wooden cylinder, revolving inside a metal one, by which sufficient heat was engendered to boil water, and perform other cooking operations without fire. Now, although as a source of power this was unphilosophical, yet as a convenient means of producing heat, under certain circumstances, it might be useful.

Dr. STENHOUSE, of Bartholomew's hospital, being called upon, said, he could express the great gratification with which he had heard the paper. It was most satisfactory and lucid—its great merit consisting in its freedom from anything like exaggeration. Indeed all the statements made that evening had been extremely moderate—and the advantages gained had been rather under than overstated.

The CHAIRMAN said, as they had heard a great deal about the application of fat, he thought they might like to hear something about producing it, and he would call upon Mr. Mechi, as a practical agriculturist, for his opinion on the subject.

Mr. MECHI said that, to obtain fat, the cattle must have plenty of heat. If they wanted to increase the weight of their cattle, they must not throw the heat to the winds. Practically it was a serious question for the farmer how best to improve his cattle. They were, no doubt, well aware that linseed and other oils were extensively used as oil cake to fatten cattle. Cotton oil—oil compressed from the seeds of cotton—had been lately introduced with success, and there could be no question of the value of anything which would tend to cheapen food. He wished the learned chairman would turn his attention to rendering their straw valuable as a fattening agent.

The CHAIRMAN—It does not contain sufficient hydrogen.

Mr. MECHI—That was just what was wanted, for it contained plenty of carbon.

Mr. VARLEY observed, that this evening witnessed the consummation of an early idea of the Society, for members would find, in the Transactions some forty years back, that for several successive years the gold medal and £50 were offered "to the person who should discover to the Society a method of hardening or otherwise preparing tallow, so that candles made be made of it which will burn as clear, and with as small a wick, as wax-candles, without running, and may be afforded at a less expense than any at present made with spermaceti."

A vote of thanks was then given to Mr. Wilson for his valuable paper.

The Secretary announced that the Paper to be read at the meeting of Wednesday next, the 30th inst., was "On Cultivation by Steam; its Past History and Probable Prospects," by Mr. John Fowler, jun. (of Bristol). On this evening Mr. J. Allen Ransome will preside.

Home Correspondence.

OBSERVATIONS BY MR. ATHERTON ON THE TONNAGE REGISTRATION DISCUSSION.

Woolwich, Jan. 17th, 1856.

SIR,—With reference to the discussion at the Society of Arts' meeting of the 16th inst. on my paper "On Tonnage Registration," I think it right to take this opportunity of explaining the few points on which my opinions, as intended to be expressed in the paper read by me, do not appear to have been correctly understood by the gentlemen who addressed the meeting. Mr. Moorsom (Inspector-General for Tonnage to the Board of Customs) is officially in a special position on this question, and his having favoured the meeting with any remarks is a concession on his part. The written communication, however, which Mr. Moorsom has made induces me to observe that my paper, though designated by Mr. Moorsom as a "condemnatory harangue," was not dictated by any feeling of groundless opposition either towards institutions, parties, or individuals, but, on the contrary, with a desire to expound the technicalities, and to reason upon the merits of this public question, and to elucidate what I conceive to be the *deficiencies* of the present system of registration as prescribed by the Merchant Shipping Act of 1854. Although, as before stated, I may not, in deference to Mr. Moorsom's official position, expect him to discuss the various points of the tonnage question, such, for example, as the desirableness of recording the capability of ships for carrying *weight* cargo as distinguished from cargo *roomage*, which is one of the deficiencies of the present law, still, I would observe, that the evidence which Mr. Moorsom adduces as being conclusive proof of the efficiency of the present law, viz., the approval of "shipbuilders, shipowners, and the highest authorities connected with maritime affairs," is evidence which I do not recognise as binding on any man who undertakes to exercise his own individual and independent judgment. It is my assertion of the *deficiencies* of our present registration which appears to constitute the objectionable peculiarity of my views on this subject. I do not consider the tonnage question to be disposed of merely because a certain method of correctly measuring a ship has been devised and legalised. Mere measurement is a matter of labour at 7s. 6d. a day, based on mathematical routine, capable of being done in a variety of ways, and I do not agree with Mr. Moorsom in regarding it as a matter of congratulation, or at all complimentary to the science of Britain, that two *legalised* methods of measuring the same ship or ships, namely, the law of 1834 and the law of 1854, should differ, as quoted by Mr. Moorsom, 7 per cent. from each other. The discrepancy of 7 per cent. indicates a process not worthy of being called measurement; has there not been bungling somewhere in this comparative measurement under the law of 1834 and the law of 1854. Mr. Moorsom appears to have rather a confused idea of my views, when he says, "Mr. Atherton would have preferred the divisor of 40 to that of 100 as the factor for tonnage measurement." I beg to explain that for expressing the *fiscal* measurement of ships, I prefer that the product of length, breadth, and depth, taken in feet be divided by 100, because, for this purpose, the divisor 100 would, I believe, give an aggregate nominal result closely in accordance with the past conventional measurement of fiscal nominal tonnage; but for expressing the cargo *roomage* of a ship, I prefer that the available internal cubature, taken in cubic feet, be divided by 40, because 40 feet, and not 100, is the ordinary conventional allowance of *goods* measurement per nominal ton; and since these distinctions do not appear to have been noticed by Mr. Moorsom, I will further explain, that for the reduction of the displacement between the light and load draught water-lines to represent the *cargo* tonnage, I prefer the divisor 35 in preference either to 100 or to 40, because 35 cubic feet of ordinary sea-water weighs one ton. Reason, not caprice, must fix our divisors.

Mr. Moorsom, or the authorities to whom he defers, have, I am happy to find, now conceded that, in addition to the present registration, it will be commercially convenient to register cargo roomage at the rate of 40 feet to the ton, which important concession redeems my harangue from being *unjustly* condemnatory of the present law; and it is to be hoped that Mr. Moorsom and the authorities on tonnage, to whom he defers, may yet be induced to approve of cargo tonnage, based on the measurement of the displacement between the light and load water-lines, at the rate of 35 cubic feet to the ton weight, being also embraced in our future tonnage registration. If these principal objects of useful registration, in addition to the present law, be conceded, I may, perhaps, still offer my opinion on the 7s. 6d. a day measurement question, but I would willingly leave this to any competent shipwright's clerk, and if taking off the lines of the ship be not objected to, I would expect this work (if done agreeably to Peake's rules, which cost 2s.) to be done within 2½ per cent. of precision, and within 5 per cent. if the taking off the lines of the ship be objected to, and the approximate result be based on length, breadth, and depth, as proposed by my paper, in accordance with the principle of the French tonnage measurement. I beg to remind Mr. Moorsom that all the points now brought forward in my paper were

duly communicated, and might have been discussed and settled while the bill of 1854 was in abeyance, before it became law, which somewhat mitigates the imputed "*illiberality*" of the present "*agitation*," and as to delaying this agitation (to which term I have no objection, provided it be not qualified as illiberal) I may observe that errors or deficiencies in legislation are difficult to correct if they once become quietly accepted as the law of the land. The sooner, therefore, the Merchant Shipping Law of 1854 is agitated and made fully effective for the useful purposes, both commercial and scientific, of tonnage registration, the easier it will be to introduce the amendments necessary for effecting that object.

Mr. Scott Russell's remarks appear to me to be a liberal exposition of the subject, disinterested and based on principle. His only misapprehension of my paper was that I advocated the substitution of either cargo tonnage or roomage tonnage in *lieu* of the present fiscal tonnage registration. This is a mistake on Mr. Scott Russell's part; I advocate the registration of the capability of ships for *weight* tonnage and for *roomage* tonnage, in *addition* to, not in substitution of, the fiscal measurement tonnage, which latter measurement ought, in my opinion, to be based on length, breadth, and depth, (as by the French law of tonnage admeasurment,) divided by such factor as would least derange the progressive ratio of our national tonnage registration, and, if so thought fit, be subject to such discriminations as may be judged to be necessary in respect of steam-ships. I thank Mr. Scott Russell for the admission that as a shipbuilder he would be *pleased*, and as a scientific man he would be *delighted*, to see the tonnage amendments suggested by my paper carried into effect.

Mr. Andrew Henderson's views appear to coincide with my own as to the objects which it is desirable that registration should embrace; but as regards the mode of effecting these objects, Mr. Henderson is the advocate of certain plans differing from mine, and which, therefore, will render more complete and comprehensive the choice of systems that will be submitted for the consideration of the Committee of the British Association, of which Mr. Henderson is a member. From Mr. Henderson's remarks, it appears that the local measurers of shipping for registration under the new law do not complete the calculation of tonnage, but merely fill up the printed formula of dimensions, which is forwarded to London for the completion of the calculations at the office of the Inspector-General; which confirms my statement that the present system of tonnage measurement and computation is not satisfactorily adapted for general mercantile convenience. It seems now to be almost impossible for a merchant himself, as heretofore, to calculate the tonnage of an intended ship, and thus conclude his bargain with a builder, without in the first place taking for granted the builder's computation, and ultimately, after the ship is built, calling in the aid of custom-house officers to measure, and of the Inspector-General for tonnage to compute, the tonnage of the ship; whereas, if the rule for builders' measurement were,—"Take the product of length and breadth, and *depth of hold* in feet, and divide by 100,"—the chief cause of the anomalies under the old rule of builders' measurement, which has been the base of building contracts since 1720, would be done away, and any merchant would be able, by one minute's calculation, to ascertain for himself, more correctly than heretofore, the nominal tonnage of his contemplated ship, leaving only the completion of the tonnage record, as to cargo tonnage and cargo roomage, to be taken from the ship when built and measured for registration.

Mr. Mitchell's remarks (resulting, no doubt, from a cursory perusal only of the proof-sheet, which had been previously distributed widely for the information of gentlemen likely to take an interest in the discussion) very appropriately call attention to two most important points, namely, whether my paper is characterised by fairness of statement as respects the sentiments and action of the Shipping Interests on the question of tonnage registration, and the supervision of shipping under the "Merchant Shipping Bill of 1854." Now, first of all, can it be said that there is any sentence in my paper unbecoming, and not fairly within the bounds of argumentative propriety in any remark of mine on this occasion. If such be the opinion of the Council of the Society of Arts, or the chairman of the meeting, I regret it, and I claim the privilege of retracting it. "Illiberality" will not aid my cause,—but what are the facts? I speak of "commercial cleverness;" surely, there can be nothing inappropriate in that term as applied to the Shipping Interests. Also, in the course of my argument, and referring to historical events connected with the House of Commons, the Reform Bill, the Free Trade movement, Joint Stock affairs, and the proceedings of corporate bodies in the professions of Law, Physic, and even of Divinity, I conclude with the following inferential remark:—"What right or reason then have we to expect that the shipping interests will voluntarily petition the legislature for an effective system of registration, throwing open the *mysteries of their craft* with a view to public good?" Such is the context of the phrase objected to by Mr. Mitchell. I apply the phrase "*mysteries of their craft*" in the sense and signification in which the phrase is known to every guild in London.

Having thus explained the phrase "mysteries of their craft," with reference to the context in which it is used by me, I may not necessarily be answerable for the inferential context in which Mr. Mitchell is pleased to place that phrase. Nevertheless, I will not decline Mr. Mitchell's invitation. Admissibly the tacit sense of my paper is, that the shipping interests are a class of business men, honest *as times go*, but certainly not purists, and the substance of my argument is, that by the adduced standards of public morality of the present time, we have no right to expect that they should be so. Does Mr. Mitchell mean to affirm that my argument is not fair towards Shipowners, for that they are purists, sighing for the public good. If so, then let us by all means worship shipowners as a class; let us go on wrecking *well-insured* ships at the rate of 1,799 ships per annum, take no official record of their *draught* on leaving port with reference to any regulation *limit*, and let us have no amendment of our Merchant Shipping Bill, because a bench of paragon Shipowners, Heaven-born millionaires, are causing the printing press to overflow with their ecstacy, in approbation of the restricted registration prescribed by the Merchant Shipping Law of 1854 as it now stands. I would, however, observe, without at all attributing fault, that I have almost invariably found insuperable difficulty in obtaining from steam-shipping agents those details of statistics which I have sought for in connection with displacements, and which I conceive to be necessary, conjointly with other data, for determining the comparative merits and value of steam-ships as locomotive machines, which data are not included in the present official registration.

I impute to the shipping interests no unworthy motive for declining to concede voluntarily such information; they have a right to refuse it if they please. The question is, whether official registration, in the cause of public good, ought not to exact the statistics referred to. As to Mr. Mitchell not being able to follow out my views to their conclusion, and desiring further information thereon—if Mr. Mitchell is really desirous to "discover in what way the rate of income-tax and the price of bread may be affected by shipping statistics," I would recommend him to make himself master of Atherton's Essay on "Steamship Capability," 2nd edit., published by Weale. Mr. Mitchell will then, I think, admit, that profligate Utopian ideas have prevailed, in regard to the capabilities of steam-ships for goods conveyance, per ton weight, at high speed, on long voyages, without re-coaling, and that the consequences of such errors, if not exposed, might involve useless churning of the sea at such pecuniary cost as would nationally affect the rate of income-tax in time of war, and

the price of bread as dependent on freight in time of peace, and that statistical registration, of a description which the Merchant Shipping Bill does not at present include, is essential to science for the exposition of such profligacy. Looking back, therefore, to what we have seen in connection with steam-shipping projects during the past two years, and the state of public delusion in regard thereto, I maintain that there is nothing figurative in my expression, that "the rate of income tax and the price of bread" may be affected, and seriously so too, as a consequence of the prevalence of such errors not being exposed, for want of the statistical data which tonnage registration ought to supply, but does not.

Steam-ship capability, as affecting the cost of freight, is quite a new study, and the sooner it is attended to by the public the better it will be for the cause of public good, especially now that British shipping is thrown open to the competition of the whole world.

We now come to the point whether or not my paper is characterised by unfairness of statement as respects the official supervision of shipping, with a view to the prevention of shipwreck. The fourth division of my inquiry into the deficiencies of the present registration refers to this point. My leading remark is as follows:—"It will not, I presume, be doubted that the too deep loading of ships constitutes one of the greatest sources of danger to which a ship can be exposed," and after remarking on the details of railway supervision, I conclude as follows:—"How strangely does this scrutinising supervision over railways contrast with the fact that the *deep draught* of a ship, on which safety at sea so much depends, is left to the caprice of parties whose pecuniary interest consists in loading a ship to the uttermost, no record being taken thereof when a vessel leaves port, and no means of proof available for judicial inquiry in the case of a ship foundering at sea with 500 souls on board." The too deep loading of ships was the source of danger thus especially brought forward by me. I submit that the investigations which I adduced substantiated my remarks as to the liability of ships being overloaded, and as neither the records of the registration, nor the specific terms of the merchant shipping act, appear to touch upon this perhaps the greatest of all sources of danger to which a ship can be exposed, it appears to me quite fair that I should avail myself of this argument touching humanity as an additional reason for introducing the registration of cargo tonnage, based on some regulation *limit* as to the deep draught water line of a ship; but having thus limited my arguments to the consideration of safety as dependent on restricting the load line within some regulation limit, it is not quite fair to expect that I should go into numerous details that have no connection with matters embraced in my paper, but, nevertheless, being rather jealous on the imputation of "unfairness" and "illiberality," I will, for the satisfaction of Mr. Mitchell, refer to "the very heavy penalties liable to be inflicted on the shipowner under the Merchant Shipping Bill of 1854 in the event of loss of life at sea," in *proved cases* of violation of the requirements of the Merchant Shipping Act of 1854.

In the matter of boats and life-buoys.—"If the owner be in fault he shall incur a penalty *not exceeding* £100, and if the master a penalty *not exceeding* £50."

In the matter of lights and fog signals.—"The master or owner if in fault shall incur a penalty *not exceeding* £20."

In the matter of the build of iron steam-ships.—"If not built and divided into compartments agreeably to the requirements of the Act, the owner shall incur a penalty *not exceeding* £100."

In the matter of details of equipment.—"If the owner be in fault a penalty *not exceeding* £100, and if the master be in fault a penalty *not exceeding* £50."

In the matter of obstructing surveyors.—"A penalty *not exceeding* £5."

The above specimens of "stringent provisions and heavy penalties," to which the shipping interests may be liable in the event of loss of life at sea, attributable to neglect in the matters referred to, are quoted in deference to Mr. Mitchell's remarks, "that it was proper the public should know that they were thus cared for and protected when travelling in British ships." From the above so-called "heavy penalties," we must deduct the attendant saving that would be effected by the non-fulfilment of the requirements of the Act in the various matters above referred to; the *balance* will show the loss or profit, as may be, that would be incurred by violating the Act, death ensuing in consequence, and the penalty paid accordingly. The striking of this balance is a mercantile, not a professional consideration. I will only further observe, that in these demonstrations of solicitude for the protection of the public, the Shipping Interests have not omitted, like business men, to care for themselves, by causing it to be embodied in the Act, in each and every case, that the above heavy penalties shall *not be exceeded*.

I agree with Mr. Mitchell—let the public have the TRUTH, by all means.

Now, seriously, are not these penalties a farce?

Mr. Mitchell will, perhaps, take the pains to ascertain the sum total of penalties exacted and the causes thereof, in connection with the 1799 cases of shipwreck, stated in the *Shipping Gazette* to have occurred during the year 1855.

With these remarks on the discussion, I now leave this registration question in the hands of the Council of the Society of Arts, hoping that they will recommend it for the consideration of the Committee of the British Association, conjointly with the other submissions that may be brought before the Committee, and that the labours of the Committee may result in measures conducive to the Public Good.

I am, Sir, your obedient servant,
CHAS. ATHERTON.

REMARKS ON MR. BLACKWELL'S PAPER, ON "THE PRESENT POSITION OF THE IRON INDUSTRY OF GREAT BRITAIN, WITH REFERENCE TO THAT OF OTHER COUNTRIES."

SIR,—In the year 1852, Mr. S. H. Blackwell, F.G.S., delivered a Lecture before the Society of Arts, Manufactures and Commerce, "On the Iron-making Resources of the United Kingdom," it being one of a series of lectures" on the "Results of the Great Exhibition of 1851," delivered at the suggestion of H.R.H. Prince Albert, President of the Society. It is admirable in its details throughout; it bears altogether on the subject matter of its title, and besides going fully into the resources of this kingdom, touches upon those of the United States of America, and draws attention to the improvement in the manufacture of iron which is taking place in other countries. During the last year a paper was read by Professor John Wilson, F.R.S.E., "On the Iron Industry of the United States;" also, one by Mr. Charles Sanderson, "On the Manufacture of Steel, as carried on in this and other Countries;" and there was likewise a paper read by Mr. Robert Hunt, F.R.S., Keeper of Mining Records, "On the Mineral Industries of Great Britain." These interesting and valuable papers all bear upon the subject, and afford preliminary matter to the paper read before your Society, at two of your meetings, on the 19th December and 9th January last, by Mr. J. Kenyon Blackwell, F.G.S., "On the Present Position of the Iron Industry of Great Britain, with Reference to that of other Countries," a subject of vast importance in itself, and bearing upon all the important interests of the country. In this latter paper Mr. Blackwell stated that the annual production of pig or crude iron appeared, from a careful comparison of various authorities, to be at the present period nearly 6,000,000 tons per annum, of which 3,000,000 tons are placed to Great Britain, and an equal quantity to the rest of the world. This, I must say, appears to me to be almost the only point bearing on the object of the Society. How far the subject might have been worked out in two more meetings, which

the chairman declared would be necessary if Mr. Blackwell (who) "had gone very fully into the geographical, geological, and chemical parts of the question," "had entered fully in the manufacturing and commercial parts," may be judged from the talent displayed; but the parts omitted, concisely and clearly brought before the meeting, are the facts which really constitute the value, in a practical point of view, of the subject itself. Of the value of the paper *per se* it will not be necessary to speak further than, as I conceive, it leaves "the present position of the Iron Industry of Great Britain with reference to that of other countries," almost untouched in, if you please, "a commercial point of view." This may be now considered an open subject, but one so important in itself, that it may still with great advantage be committed to the hands of those who have the opportunities and requisite knowledge to bring it before your Society and the intelligent public.

In reading the discussion which took place upon the paper, I was strongly impressed with the use of the suggestion I made in some letters I wrote in your *Journal* last year, "On the Statistics of the Iron Manufacture." My suggestion was not met in any way further than by one letter of approval, from Mr. Thomas M. Gladstone. But, nevertheless, such information would regularly supply that want which the very title of the paper read offers for our consideration. With respect to Professor Wilson's paper "On the Iron Industry of the United States," it was, I think, wanting in particulars which might have been a useful guide to our manufacturers, he having peculiar advantages for obtaining information with regard to detail of cost and transit. American Statistical Societies give this information. Again, in France, the Minister of Commerce was good enough, a short time back, to send me at my request, a copy of his report, "Des Travaux Statistiques de l'Administration des Mines in 1847, 1848, 1849, 1850, 1851, and 1852." This work contains an immense and valuable mass of information bearing on all points connected with the manufacture of iron. In this we are deficient from the apathy of the ironmasters, and more particularly that of the parties interested in the consumption, for it is the public who are really most concerned in the question. The ironmasters satisfy themselves with their iron make; they push for quantity, sell it, and care no more about it. With respect to the remarks made by Mr. Blackwell, on the contributions of the iron manufacture to the Paris Exhibition, that "the quality of the iron exhibited was not shown in any conclusive or advantageous manner, nor were there any specimens displayed proving the application of greater or even of equal mechanical power in the working of iron in this country as compared with others," I cannot say how this might be, not having been present at the Exhibition, but I must say that generally, the quality of the iron in this country is not sufficiently considered, and an observation of Mr. Anderson's will tend to show that if the ironmasters are not very particular in their make, it arises in some measure from their not being looked after:—"In the position which he (Mr. Anderson) occupied, where the quality of iron was the chief object, and from having ample opportunity of knowing how little was done to improve the quality of our material, not only by the ironmasters who make it, *but also by the engineers who use it*, he felt at no loss for the cause of this lamentable condition." I do not hesitate to say that if *quality* were a consideration with buyers, the whole make of Blaenavon iron would always be sold in advance, but this encouragement is not afforded. But when masses of rails, 80 feet long, which prevented any examination of the quality of the smaller specimens of iron, were exhibited (as mentioned by Mr. Blackwell in his concluding remarks), it must pretty clearly have proved to those acquainted with the power of the machinery necessary to turn out a sound and well-finished rail of such a length, that the machinery must have been of considerable power, and so far, more than equal to the usual requirements. Mention is also made of cast-iron pipes "six feet diameter, but England had none there." This is a decided and important improvement in the manufactures of France. The foundry has long existed in this country without a rival, except for the smaller kinds of castings. "Ship-building and the casting of iron cannon" are mentioned, as the sole manufactures in which the English excelled in the reign of James 1st, and it is noticed in "Macpherson's Annals of Commerce," "that in 1788 orders were sent from Paris to Mr. Wilkinson (a gentleman of great eminence in the iron manufacture) for iron pipes, to the extent of no less than forty miles, to be used in supplying that capital with water." I think, however, iron pipes of any diameter would have been out of place in the English department. On the quays of Liverpool any quantity of iron pipes, somewhere about five feet in diameter, might lately have been seen, for the supply of that town with water, but there could be hardly a limit to any required size.

A correspondence in the *Mining Journal*, between Mr. Truran, the author of a new work on "The Iron Manufacture of Great Britain," and Dr. Henry M. Noad, who signs himself "Consulting Chemist at the Cwm Celyn and Blaina Works," would lead us to suppose that, at any rate, the quality of the iron at those works is attended to. Some of the great ironmasters might smile at the idea of such an officer appended to their works, but there are others who must think differently, or such an appointment would not have been made. The important point elicited in this correspondence is, that a furnace at those works occasionally makes 250 tons a week, and its usual weekly average is from 220 to 240 tons (equal nearly to a week's work of England and Wales in 1740), a make stated to be suitable for "railway bars, that may challenge competition with any made at Dowlais or elsewhere."

No doubt a great deal has been done in this country of late years to increase the strength of cast-iron. At the time when railways were first coming into active operation (about 1836), the cast-iron chairs were so weak, (the rail itself, the fish-bellied and others being about 35lbs. per yard), that there were constant complaints of the probable danger as well as positive loss from the vast quantities which were broken. With a view to obviate this evil, I took out a patent for malleable iron chairs, but I, like other patentees, had only loss from my invention. The increased weight of the rails, the improvement in strength, in the cast-iron, from the mixture of metals, and the disinclination of the ironmasters to carry it out, as every engineer, in those days, had a fancy of his own, it was considered that the expense would be too great to suit every new rail with an expensive set of rolls, besides which, and the more important fact with regard to the make was, that the cast-iron chairs would yield a more ready profit. I corresponded with the late Mr. George Stephenson and other eminent engineers on the subject. They all approved highly of the suggestion, but the means of supply were not afforded. I had not the opportunity of making them myself in any quantity—but, (besides some chairs for contractors' rails) I rolled about 50 tons for the Earl of Durham, and some time afterwards, being at his colliery, I spoke to the engineer about them, and he said he wished that they had been laid down throughout the whole of the lines, as they had never moved or required removal. This patent, although of no further use to me, may still, I think, be used to great advantage. The rails are now generally uniform in shape, and these chairs can be rolled without difficult to any size, and are easily cut with the circular saw. Foreigners, in particular, might do well to consider this, especially where they have not facilities for re-casting broken cast-iron chairs.

In conclusion, I beg respectfully to suggest to the Council the titles of two papers on the Iron Manufacture, which I conceive likely to afford very valuable information, and admit of equally valuable discussion:—

First. The manufacture of iron with reference to the use of the hot and cold blast—and also, as to the waste

of fuel by the present system of calcining the blackband iron-stone.

Second. The present position of the Iron Industry of Great Britain, with reference to that of other Countries, as regards the cost of production and transit.

It was well observed by a French writer some time back, that "Ce que l'on nomme en France la question du prix des fers, est, à proprement parler, la question du prix des bois, et la question *des communications interieures par les routes, fleuves, rivières et canaux.*"—Yours faithfully,

HARRY SCRIVENOR.

Ramsey, Isle of Man,
Jan. 17th, 1856.

THE SURGICAL INSTRUMENT IN THE PARIS EXHIBITION.

62, Strand, Jan. 23, 1856.

SIR,—In the discussion upon Mr. Blackwell's paper on the Iron Trade, Mr. Kennard said, that at the Great Exhibition the French had surgical instruments which for finish and workmanship surpassed our own.

Now this was not the case; our instruments were equally well-finished and better made than theirs, and of this the French jurors were perfectly aware, for they distinctly refused to examine any instrument for its workmanship only; all they wanted was "novelty," and it was in consequence of this evident partisanship and the urgent *personal* solicitations of one of the French exhibitors, backed by the two jurors, his countrymen, for a higher class medal than was designed to be given, that decided the English instrument-makers not to exhibit in the French Exposition.—I am, Sir, your obedient servant,

R. WILLIAMS.

Proceedings of Institutions.

LIMERICK.—The first general meeting of the members of the Athenæum was held on the 3rd inst. On this occasion the new lecture-hall was opened. It is of noble proportions, simple in design, and is said to be one of the finest halls for its special purposes in Ireland. The meeting was held in the apartment devoted to the agricultural club, and the chair was occupied by Alderman JOYNT. The secretary, Mr. FITZ GERALD, having been called on by the chairman, proceeded to read the minutes, the report of the Council for the past year, and the laws of the association. When the Report, which referred to the exertions of the committee to secure the present site, the selection of plans, the collection of subscriptions, the labours of the past year, was read, the Rev. JOHN BRAHAN proposed and Mr. ALEXANDER seconded, that the report be adopted and published. The SECRETARY then read the account of the receipts and expenditure, which was likewise ordered to be published. The laws of the Society were again read, and after some discussion were amended. —The CHAIRMAN then stated that the foundation of a Free Public Library in Limerick would confer lasting advantages on the citizens, and he hoped the members would not separate without passing a resolution which he had prepared, to the effect that, inasmuch as a free public library would benefit all classes, but especially those who could not buy or procure books, and as the establishment of a free library would be sure to lead to donations of books and money, it be an instruction to the Council of the Athenæum to give the project all the aid in its power.—The Rev. JOHN BRAHAN and Mr. J. T. SEYMOUR agreeing most cordially with the chairman's suggestion, proposed and seconded the resolution, which was carried.—Mr. ALEXANDER next proposed a resolution, directing the Council to summon a meeting of the friends of agriculture in the county and city, in order to establish a Farmers' Club, to have lectures on agricultural science delivered in the lecture-hall, and to have the club-room comfortably fitted up for the use of the members, and supplied with books and periodicals.—Mr. MILLINGTON seconded the resolution, which was then put and carried.—Samuel Alexander, George Westropp, and Wm. Fitzgerald were re-elected trustees of the Athenæum.—The CHAIRMAN then stated that from the beginning the undertaking had had to labour with many difficulties, but the generosity of the citizens had enabled them to overcome them all. The objects were such as commended themselves to every citizen and friend of Limerick. To elevate and refine the minds of all—to place within the reach of the humblest as well as the highest the means of intellectual training and discipline—to secure one spot in Limerick, far removed above the noise of political discussion or religious strife; these were some of the objects they were striving to attain.—The ballot for members having taken place, the following Council, which represents all classes and parties in the city, was elected:—Alderman Joynt, Thomas Fitt, Samuel Alexander, Rev. John Brahan, Dr. Evans, Wm. Fitzgerald, Dr. Griffin, Robert Hunt, J. T. Mac Sheehy, Dr. Kane, John M'Kern, Henry O'Shea Richard Russell, James Barry, J. P., Revs. Wm. Tarbotton, George Westropp, Archdeacon Keating. —The Mayor and three members of the corporation are ex-officio members of the Council, and each of the affiliated societies send two deputies to the Council.

ROYSTON.—At the Annual General Meeting of the members of the Mechanics' Institute, held on Monday evening, January 7th, John Fordham, Esq., in the chair, the secretary (Mr. John Warren) read the report. It stated that the total expenditure of the year was £73 12s. 1d.; the total income £73 3s. 5d.:—showing a deficiency of 8s. 8d., which sum had been advanced by the secretary. The number of members and subscribers (including 9 life members) was 248; of these 10 paid 6s., 1 paid 5s., 174 paid 4s., 7 paid 2s. 6d., 47 paid 2s., and 9 had paid a life subscription. The classification of these 248 members presents:—1 local magistrate, 4 ministers of religion, 1 member of the House of Commons, 24 private gentlemen, members of the learned professions, merchants, manufacturers, and architects, 45 tradesmen, &c., 13 farmers, 32 mechanics, shopmen, and town labourers, 106 females, and 22 youths under 18. A subject not less interesting is the *constancy* shown by members in subscribing. Of the 248 members, there were 48 new; 37 had subscribed more than 1 year and less than 3 years; 103 for 3, 4, or 5 years; 51 for more than 5 years, and 9 for life. Ten lectures were delivered during the year, the lecturers being the Rev. W. G. Barrett, Dr. Trevethan Spicer, Messrs. Joseph Fearn, George Barker, W. J. Notley, George Buckland, J. Bennett, and Mrs. Grosvenor. Two of these were for the benefit of the Building Fund, which was enriched in consequence by the sum of £7 6s. 0d. During the past year, 44 vols. were added to the library; of these, 31 were purchased, and 13 were donations. Mr. Isaac Beale, the librarian, has drawn up the following statement:—

Number of members making use of the library during the year	98
Number of evenings for issuing books	51
Number of volumes issued	1477
Ditto ditto renewed	723
Giving a total number of volumes	2200
And an average number for each evening of...	43·14

Eighty-seven members subscribed to the reading-room last year. The room was open 311 evenings; 6055 visits were paid to it; and the average number of members each evening was 19·47. The French classes, conducted so liberally by Mr. F. F. Frechet, were closed in the early part of the year. The report was unanimously adopted, the treasurer's accounts approved, and the committee of 1856 elected. The revised rules recommended by the committee were then read, and, after some discussion as to the alteration of the title of the Institute, were passed almost unanimously. Thanks were then voted to Mr. John Fordham, for his services as secretary of the preliminary savings bank, to Mr. Warren as secretary of the Institute, and to Mr. Isaac Beale as librarian.

MEETINGS FOR THE ENSUING WEEK.

MON. Actuaries, 7.
London Inst., 7, Dr. John Tyndall, "On the Nature and Phenomena of Heat."
British Architects, 8, Adjourned Discussion on Mr. C. H. Smith's paper, "Remarks on the Forms, Methods of Casting, and Ringing of Large Bells; with suggestions on the subject."
Entomological, 8, Anniversary.
Geographical, 8½, 1. Copy of a letter from Chief Factor James Anderson to Sir George Simpson, Governor-in-Chief of Rupert Land, dated Fort Resolution, September 17th, 1855; 2. Mr. A. G. Findlay, "On the probable Route of Sir John Franklin's Expedition;" 3. Arctic Discussion, continued from last meeting.

TUES. Royal Institution, 3, Professor Huxley, "On Physiology and Comparative Anatomy."
Civil Engineers, 8, Discussion upon Mr. Robinson's paper, "On the Past and Present Condition of the River Thames."

WED. London Inst., 3 Mr. Robert Grant, "On Elementary Astronomy."
Society of Arts, 8, Mr. John Fowler, jun., "On Cultivation by Steam; its Past History and Probable Prospects."

THURS. Royal Institution, 3, Professor Tyndall, "On Light."
London Inst., 7, Mr. R. Grant, "On the Natural History of Extinct Animals."
Numismatic, 7.
Antiquaries, 8.
Royal, 8½.

FRI. Botanical, 8.
Royal Institution, 8½, Prof. Tyndall, "On the Disposition of Force in Paramagnetic and Diamagnetic Bodies."

SAT. Asiatic, 2.
London Inst., 3, Mr. T. A. Malone, "On the Elementary Principles of Animal and Vegetable Chemistry."
Royal Institution, 3, Professor Odling, "On Organic Chemistry."
Medical, 8.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette January 18th*, 1856.]

Dated 16th November, 1855.

2584. William Cooke, 49, Frederick-street, Gray's inn-road—Improved apparatus for cleaning knives and other cutlery.

Dated 21st November, 1855.

2624. William Cooke, 49, Frederick-street, Gray's-inn-road—Improvements in gas and solar light reflectors.

Dated 29th November, 1855.

2698. George North, Lewisham-road, Greenwich—Improved portable apparatus for supporting and folding heads, tilts, coverings, and awnings of wheel carriages, marine vessels, goods, and ways.

Dated 10th December, 1855.

2780. John Hall, jun., Mount Pleasant, Walmersley, near Bury—Improvements in jacquard looms.

Dated 12th December, 1855.

2807. Isaac Beardsell, Huddersfield—Improvements in the finishing of mohair cloths and other textile fabrics, and in the machinery employed for that purpose.

2809. Robert Midgley and George Collier, Halifax—Improvements in preparing worsted, mohair, alpaca, cotton, and other yarns.

2811. Richard Holben, Barton, Cambridgeshire—Improvements in apparatus for chapping barley.

Dated 13th December, 1855.

2813. John Roberts, Falmouth—Improvements in machinery for moulding bricks and tiles.

2815. Alphonse Louis Poitevin, Paris—Improved photographic printing.

2817. James Murdoch, 7, Staple-inn—A process for separating the oleine from the stearine of fatty and oleaginous bodies, and for the extraction of oil from oleaginous grains and from olives. (A communication.)

2819. John Little, Glasgow—Improvements in heating and cooking apparatus.

1821. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for containing compressed air or gases, and in the application of the same to the obtainment of motive power. (A communication.)

Dated 14th December, 1855.

2823. John Walter Friend, Freemantle, Southampton—Improved registering log and deep-sea lead.

2825. Alfred Krupp, Essen, Prussia—Improvements in railway and other wheels, and in the method of, and machinery for, manufacturing the same.

2827. Charles John Todd and Robert Pinkney, Long-acre—A balance pen.

2829. Peter Haworth, Manchester, and Alexander Forrest, Birmingham—An improvement in the manufacture of belts, bands, braces, and other similar articles of wearing apparel.

Dated 15th December, 1855.

2831. Leonard Clayton, Unsworth, Lancaster—Improvements in machinery for dressing yarn.

2833. John Aspinall, Limehouse—Improvements in machinery for curing sugar and extracting moisture therefrom, parts of which are applicable to separating liquids and moisture from substances containing the same.

2837. Agnes Wallace and John Wallace, Nether Place Bleach Works, Renfrew, N.B.—Improvements in bleaching, washing, or cleansing textile fabrics and materials.

2839. William Clay, Liverpool—Improvements in the manufacture of bar iron.

2841. William Clay, Liverpool—Improvements in the manufacture of iron and steel.

Dated 17th December, 1855.

2843. Samuel Fletcher Cottam, Manchester—Improvements in mules for spinning cotton and other fibrous materials.

2845. Charles Bracegirdle, Congleton—Improvements in the manufacture of bolting cloths employed in dressing flour.

2847. John Lobb Jeffree, Blackwall—Improvements in or additions to furnaces.

2849. Frederick William East, 185, Bermondsey-street—Improvements in water-proofing and enamelling textile and other fabrics, in imitation of and to be used in lieu of leather, and for other similar purposes.

2851. William Sangster, Cheapside—Improvements in the manufacture of stays and corsets.

2853. William Hemsley, Melbourne, Derby—Improvement in the manufacture of elastic pile fabrics.

2855. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in ships' tillers. (A communication.)

2857. William Wilkinson, Nottingham—Improvements in machinery employed in the manufacture of looped fabrics.

Dated 18th December, 1855.

2859. Alexandre Tolhausen, 7, Duke-street, Adelphi—Improved harvesting machine. (A communication.)

2861. Christopher Nickels, Albany-road, Surrey, and James Hobson, Leicester—Improvements in the manufacture of pile fabrics.

2863. Alfred Vincent Newton, 66, Chancery-lane—Improved mode of manufacturing wrought-iron cannon. (A communication.)

2865. Alfred Vincent Newton, 66, Chancery-lane—Improvements in washing machines. (A communication.)

2867. Frederick Robert Augustus Glover, M.A., Bury-street, Saint James—Improved instrument or apparatus for taking angles, and measuring lines, surfaces, and solids, and ascertaining the variation of the needle.

Dated 19th December, 1855.

2869. Joseph Cartwright, Hyde, Chester—Improvements in taps or valves.

2871. Richard Ruston, Birmingham—Improvements in the construction of anchors, and appendages to be used therewith.

2873. Josiah Sanders, Bristol—Improvements in trusses for supporting parts of the human body.

2875. George Harvey, Charlotte-street, Portland-place—Improvements in portfolios.

Dated 20th December, 1855.

2877. Robert William Sievier, Upper Holloway—Improvements in guns and pieces of ordnance, and the projectiles thrown from them for the purposes of war.

2879. James Fleming, jun., Newlands-fields, Renfrew, N.B.—Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.

2881. Evan Evans, South Wales—Improvements in combining and fixing railway bars.

2883. Philip Antrobus, Chepstow—Improvements in preserving and packing flour.

2885. Alexander Charles Louis Devaux, King William-street—Improved machinery for crushing and grinding vegetable and other substances.

Dated 21st December, 1855.

2887. David Dunne Kyle, Albany-street, Regent's-park—A method of communicating motion.

2889. John Watson, Glasgow—Improvements in the manufacture or production of articles of ladies' dress.

2891. Bernard Hughes, Rochester, New York, U.S.—A mode of mingling the vapour of bi-sulphuret of carbon and steam, and applying them as a motive power.

2893. Charles James Appleton, Manchester—Improvements in machinery or apparatus for knitting. (A communication.)

2895. Edward Tyer, Cornhill—Improvements in telegraphing or communicating by means of electricity.

2897. Charles Glover, Lincoln—Removing snow from a line of railways.

Dated 29th December, 1855.

2942. Lewis Harrop, Samuel Barlow, and Alexander Boyd, Oldham—Improvements in self-acting mules for spinning and doubling cotton and other fibrous materials.

2944. Alfred Ford, Park-lodge, New-road, Hammersmith—Preparing and dissolving in naptha or oil of turpentine vulcanised india-rubber, for the purpose of waterproofing, and all or any of the other purposes for which the same, not so prepared and dissolved, is now applicable.

2946. William Lange, 56, Tachbrook-street—Improvements in biscuit ovens. (A communication.)

2948. George Royds Birch, Paddington—A form and folding desk combined, adapted for the use of schools.

2950. Thomas Holmes, Hull—Improvement in the manufacture of driving straps or bards for machinery.

Dated 31st December, 1855.

2954. Joseph Salter, Manchester—Improvements in apparatus for promoting the draught in chimneys, and for ventilating apartments.
2956. Archibald Turner, Leicester—Improvements in the manufacture of looped fabrics.
2958. George Hallen Cottam, St. Pancras Iron Works, Old St. Pancras-road—Improvements in applying detonating or exploding signals on the rails of railways.

Dated 1st January, 1856.

2. Ferdinand Swift, Brompton-row, Brompton—Improvements in carriage wheels and axles, and in vehicles for common roads.
4. Alfred Vincent Newton, 66, Chancery-lane—A novel system of propulsion, applicable to land and water. (A communication.)
6. Alexander Cochrane, 11, Eaton-terrace, St. John's-wood—Improvements in collecting and distributing water and alluvial deposits contained in sewage and other water.

Dated 2nd January, 1856.

10. Richard Albert Tilghman, Philadelphia—Improvements in the manufacture of iron.
12. Harvey Lewis Sellars, M.D., and John Littler Talbott, Cincinnati, U.S.—Improved apparatus for measuring and weighing grain, seeds, and other substances. (A communication.)

Dated 3rd January, 1856.

14. Frederick Haines, Lime-street, City—The deadening of the sound and the prevention of concussion in connection with machinery, gun and mortar boats, and general ordnance, and other purposes.
16. George Williams, 16, Cannon-street east—Improvements in the construction of water-closets for ships.
18. William Alfred Distin, 31, Cranbourne-street, Leicester-square—Improvements in pipes for smoking.
22. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus or means for facilitating the performance of church and other music on organs, harmoniums, pianos, and other similar keyed musical instruments. (A communication.)
24. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in breech-loading firearms. (A communication.)
26. James Frederick Lackersteen, 7, Young-street, Kensington-square—Improvements in the prevention of collisions on railways.
28. Charles Marsden, Kingsland-road—Improvements in the ventilation of sewers, tunnels, mines, and other confined places.

Dated 4th January, 1856.

30. Henry Bach, Sheffield—Improvements in the application of glass to decorative purposes.
32. William Simmons, Oldham—Improved hat body.
34. Thomas Hudson, South Shields—Improvement in furnaces.
36. Edward Hammond Bentall, Heybridge—Improved machinery for pulping turnips and other vegetable matters.
38. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in the manufacture of jacquard piled, or terry fabrics, when parti-coloured yarns are used. (A communication.)
40. Francis William Gerish, East-road, City-road—Improvement in the manufacture of cast hinges.
42. William Oliver Johnston, Broomhill Colliery, Acklington, Northumberland—Improvement in apparatus used for giving notice when the water in a steam boiler is too low.
44. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in the manufacture of iron and steel.

Dated 5th January, 1856.

46. James Coxeter, 22, Grafton-street-east—Improvement in an apparatus for generating steam for medical and other purposes.
48. Joseph Corbett, Brierly-hill—Improved method of preserving the tuyeres of blast furnaces.
50. Conrad Abben Hanson and John Wormald, Belmont, Vauxhall—Improvements in signal and other lamps.

Dated 7th January, 1856.

52. Charles Jarvis and Thomas Deykin Clare, Birmingham—Improved oven or kiln to be used in the manufacture of coke and pottery, and for heating and drying generally.
54. Thomas Barter, Hart-street—Improved apparatus for administering vapour and douche baths.

Dated 8th January, 1856.

60. George Baring Locke, Notting-hill, Kensington—Improvements in signalling from trains whilst in motion.
62. Henry Stuart, Liverpool, and Thomas Pritchard, Runcorn—Improvements in watches and chronometers, which improvements are also applicable to clocks and other time-pieces.
64. Samuel Middleton, St. George's-row, Southwark—Improvement in the leather-covered rollers used in spinning machinery.

Dated 9th January, 1856.

66. George John Christian Erhard Hald, Manchester—Improvements in the construction of stoves. (A communication.)
68. Victor Jeanne, Adolphe Martin, and Michel Edmond Martin, Paris—Improved grease box for axles, journals, and other rotary parts of machinery.
70. Edward Hallen, Cornwall-road, Lambeth, and William Holland Kingston, Bandon, Cork—Improvements in communicating between the guards and engine drivers, and between the passengers, guards, and engine drivers of railway trains.
72. Anker Heegaard, Copenhagen—Improvements in making channels or flues.
74. Charles Mathew Barker, 25, Kennington-lane—Improvement in the pistons of steam engines.
76. Henry Adcock, City-road—Improvement in casting iron and other metal.

WEEKLY LIST OF PATENTS SEALED.

Sealed January 18th, 1856.

1051. Edwin A. Forbush.
1610. Felix Hoyos.
1657. John Walter Cawley Wren.
1659. George Hepplewhite.
1668. Auguste Achard.
1698. Thérèse Alexandrine Poncelin.
1702. Thomas Dawson.
1730. William Truran.
1794. Nathaniel Smith.
1843. Mark Mellor.
2164. Thomas Clegg.
2259. Narcisse Leroy.
2267. John Thornton, Albert Thornton, William Thornton, and Henry Thornton.
2295. Thomas and William Hemsley.
2297. Manuel Perez Lozano.
2299. John Stenhouse.
2305. James Miller Brown and Thomas Brown.
2371. Thomas Richardson.
2391. John Andrew Richards.

Sealed January 22nd, 1856.

1669. George Handson Rollet.
1674. Henry Stent.
1676. Benjamin Wood.
1677. John Henry Johnson.
1678. John Henry Johnson.
1690. Vincent Scully and Bennett Johns Heywood.
1693. Christian Schiele.
1706. Capt. William Allen, R.N.
1708. John Aaron Benfield.
1712. John Whitehead, jun., and Robert Kay Whitehead.
1747. Alexander Allan.
1767. Robert Richardson and Walter Greenshields.
1821. Edwin Ullmer and William Ullmer.
1837. Thomas Butler.
1972. Robert Walter Winfield and John Jackson.
2032. Robert Barnard Feather.
2147. Felix Bouchet.
2236. James Washington.
2439. William Taylor.
2459. James Pattison.
2465. Thomas Ridgway Bridson.
2470. George Collier.
2485. Alfred Vincent Newton.
2486. Alexander Charles Louis Devaux.
2910. Thomas Godding.
2513. George Tomlinson Bousfield.
2529. William Henry Bentley.
2623. Alexandre Tolhausen.
2654. Hiram Hyde.
2668. Hiram Hyde.
2676. John Henry Johnson.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

January 15th.

110. Thomas Potts and James Septimus Cockings.

January 16th.

121. Henry Browning.
128. Robert Neale.
131. Joseph Rock Cooper.

January 17th.

123. Orlando Reeves.
145. Georges Edouard Gazagnaire.
464. William Spence.

January 18th.

138. Peter Rothwell Jackson.
181. Andrew Edmund Brae.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3804	January 21.	Composing Stick.....	R. Besley and Co.	Fann-street, Aldersgate-street.